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# Evaluation of CD Scribed Strip from the 1st Continental Disc

T. H. Shen, T. Y. Dye

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## Disclaimer



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# Evaluation of the 1st Scribed Strip from the Continental Disc

Tien H. Shen

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In July 2013, the NIF has entered an agreement with the Continental Disc (CD) to improve the fatigue life of the rupture panel with a serious of experiments. In the **Phase I** of the experiment, the CD has agreed:

1. to precision-grind the rotary score blade, with a concentricity of less than 0.0005" (12.7 μm), and to provide a 0.003" to 0.005" (76 to 127 μm) radius on the scoring edge,
2. to precision-grind the new score anvil with a concentricity of less than 0.0005" (12.7 μm),
3. to use the 50-ton rotary score press (RSP-HYP-50T) for scoring,
4. to achieve a minimum un-scored depth of 100 μm using a 4"-wide, 30"-long ,and 0.010"-thick AA3003-H14 strip.

This memo summarizes the result of our measurements on the 1st strip we received on Oct. 9, 2013 from the CD.

## Results and Discussions

We sectioned 35 locations along the scored strip at 1"increment starting at ½" from the beginning of the scored line. **Figure 1** shows a typical cross-section of three grooves in this strip and the definitions of measurements conducted on these three groves.

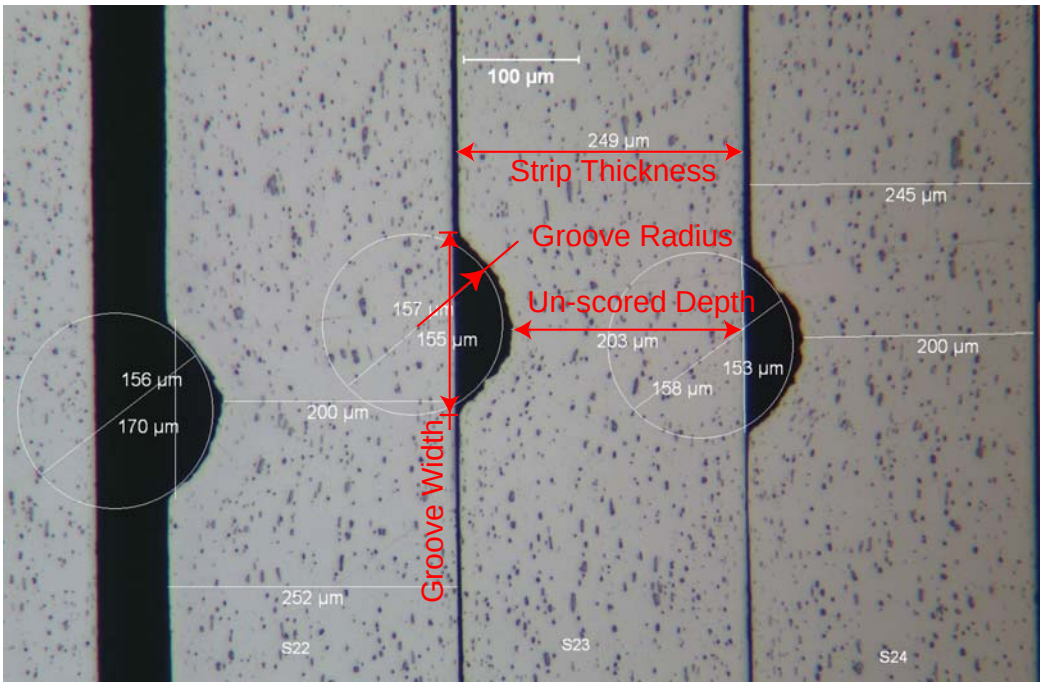


**Figure 1** A typical example of three grooves in this strip and the definitions of measurements conducted on these three groves.

**Table I** lists the un-scored depth, groove width, groove radius, and strip thickness of these 35 locations along the scored line. The average un-scored depth is 21921 μm with a standard deviation of 9.8 μm. Evidently, this is far greater than the 100 μm as the targeted un-scored depth.

**Table I** The un-scored depth, grove width, groove radius, and strip thickness of these 35 locations along the scored strip.

| **Distance from the Start** (inch) | **Un-scored Depth** (μm) | **Groove Width** (μm) | **Groove Radius** (μm) | **Strip Thickness** (μm) |
|---|---|---|---|---|
| **0.5** | 222 | 110 | 72 | 247 |
| **1** | 225 | 107 | 72 | 249 |
| **2** | 230 | 93 | 64 | 248 |
| **3** | 218 | 104 | 55 | 247 |
| **4** | 218 | 126 | 63 | 249 |
| **5** | 200 | 149 | 63 | 247 |
| **6** | 204 | 139 | 43 | 247 |
| **7** | 218 | 116 | 52 | 250 |
| **8** | 227 | 95 | 50 | 248 |
| **9** | 228 | 109 | 61 | 255 |
| **10** | 221 | 111 | 69 | 249 |
| **11** | 214 | 214 | 69 | 250 |
| **12** | 218 | 111 | 69 | 249 |
| **13** | 226 | 98 | 68 | 250 |
| **14** | 228 | 90 | 65 | 250 |
| **15** | 226 | 112 | 74 | 249 |
| **16** | 208 | 128 | 53 | 247 |
| **17** | 210 | 144 | 79 | 251 |
| **18** | 225 | 110 | 61 | 249 |
| **19** | 222 | 99 | 34 | 249 |
| **20** | 217 | 119 | 70 | 249 |
| **21** | 213 | 131 | 76 | 249 |
| **22** | 200 | 170 | 78 | 252 |
| **23** | 203 | 155 | 79 | 249 |
| **24** | 200 | 153 | 79 | 247 |
| **25** | 220 | 113 | 64 | 250 |
| **26** | 230 | 90 | 64 | 248 |
| **27** | 232 | 94 | 66 | 249 |
| **28** | 227 | 98 | 66 | 250 |
| **29** | 216 | 130 | 75 | 249 |
| **30** | 204 | 144 | 84 | 250 |
| **31** | 213 | 123 | 81 | 250 |
| **32** | 224 | 112 | 74 | 249 |
| **33** | 229 | 92 | 59 | 249 |
| **34** | 232 | 86 | 60 | 246 |
| **Average** | **219** | **119** | **66** | **249** |
| **STD** | **9.8** | **26.9** | **11.0** | **1.7** |

**Figure 2** shows the variation of the un-scored depth along the scored line. The difference in peak-to-valley un-scored depth appears to be around 30 μm (0.0012”), and repeated at an interval of every 5.5” along the scored line. For comparison, **Table II** lists the un-scored depth of panels we measured in the past three year from various fracture panels. It shows that the current tooling and scribing practice did offer some improvement in reducing the variation in un-scored depth. However, the **Non-failed Panels**, as shown in **Table II,** did achieve a smaller variation in un-scored depth. It will be valuable to find out how these

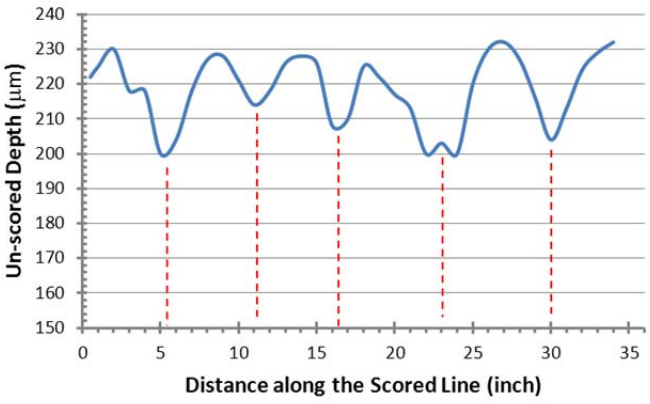


**Figure 2** The variation in un-scored depth along the scored line.

small variations were achieved during the scoring at CD in 2011 or earlier.

**Table II** The un-scored depth of panels we measured in the past three years at NIF.

| | Panel ID | Serial Number | Batch Number | Date Removed from Service | Un-scored Thickness (μm) | Standard Deviation (μm) |
|---|---|---|---|---|---|---|
| Failed Panels | **# 4** | AAA02-101378-OA-033 | CDC8008595 | 4/5/2011 | **100.2** | **7.8** |
| | **# 5** | AAA02-101378-OA-021 | CDC8121612 | 2/16/2012 | **98.8** | **12.6** |
| | **# 6** | AAA02-101378-OA-026 | CDC8121612 | 2/16/2012 | **94.7** | **10.2** |
| | **# 7** | AAA02-101378-OA- ? | CDC8121612 | March 2012 | **89.1** | **12.5** |
| | **M1** | AAA02-101378-OA-0427 | CDC8194597 | 12/1/2012 | **94.8** | **12.7** |
| | **M2** | AAA02-101378-OA-0434 | CDC8194597 | 12/1/2012 | **95.1** | **12.3** |
| Non-failed Panels | **Q33T** | AAA02-101378-OA-066 | CDC8012519 | March 2011 | **103.7** | **4.9** |
| | **Q45B(1)** | AAA02-101378-OA-067 | CDC8012519 | 4/5/2011 | **104.4** | **7.0** |
| | **Q45B(2)** | AAA02-101378-OA-079 | CDC8012519 | 3/26/2011 | **103.6** | **6.4** |
| | **TSA25** | AAA02-101378-OA-126 | CDC8011653 | March 2011 | **96.3** | **8.0** |
| | **Q23T** | AAA02-101378-OA-185 | | Feb 2012 | **96.7** | **9.1** |
| New Panels* | **N1 (FY11)** | AAA02-101378-OA-0424 | CDC8194597 | | **93.6** | **12.1** |
| | **N2 (FY11)** | AAA02-101378-OA-0428 | CDC8194597 | | **91.9** | **14.6** |
| | **N3 (FY09)** | AAA02-101378-OA-024 | CDC8133312 | | **78.5** | **6.4** |
| | **N4** | AAA02-101378-OA-169 | CDC8011653 | | **92.4** | **10.5** |

* These new panels were never installed. They were sectioned to check the scribing condition. Due to the smaller un-scored depth, these panels were predicted to fail early.

## Conclusions

- It is evident that the un-scored depth in this strip is much greater than the targeted 100 μm. Several iterations in scribing will be necessary to achieve the targeted depth.

- The variation in un-scored depth is around 30 μm (0.0012”). It will be interesting to compare the actual concentricity measurements on the scoring wheel and the anvil.